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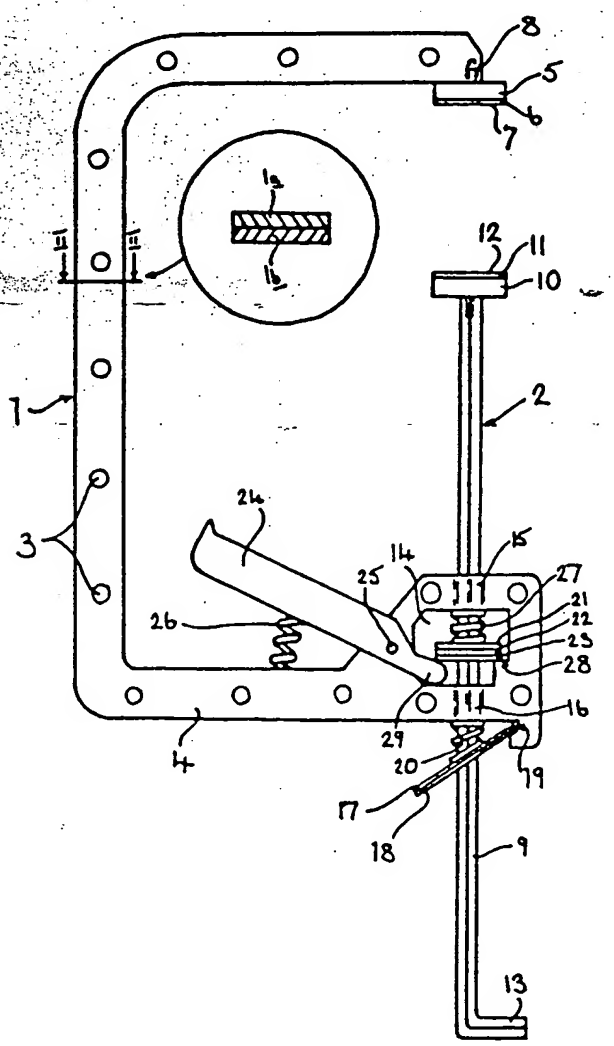
(71) Applicant
David John Richmond,
182 Widney Road, Bentley Heath, Solihull, West Midlands

(72) Inventor
David John Richmond

(74) Agent and/or Address for Service
Stephen A. Craske,
Craske & Co, 347 Widney Road, Knowle, Solihull, West Midlands B93 9BQ

(54) A clamp for single-handed operation

(57) A C-shaped frame 1 carries a first clamp face 7 and axially guides a thrust member 2 carrying an opposed co-acting second clamp face 12. A one-way locking plate arrangement 17, 18 is biassed by spring 20 to tilt into a locking position and so permit unidirectional movement of the thrust member in a clamping direction. A trigger 24, pivoted to the frame at 25, is biassed away from a handle portion 4 of the frame by a spring 26. The trigger carries an actuating nose 29 which acts on a drive plate arrangement 21–23 which is biassed by a spring 27 into a released position. Upon squeezing the trigger 24 the nose 29 tilts the plates 21–23 into a locking position and causes them to advance the thrust member in the clamping direction. The clamp is released by tilting the locking plate arrangement 17, 18 to a released position. Clamp faces 7, 12 are provided by replacement clamp heads 5, 10 and may comprise V-shaped grooves.



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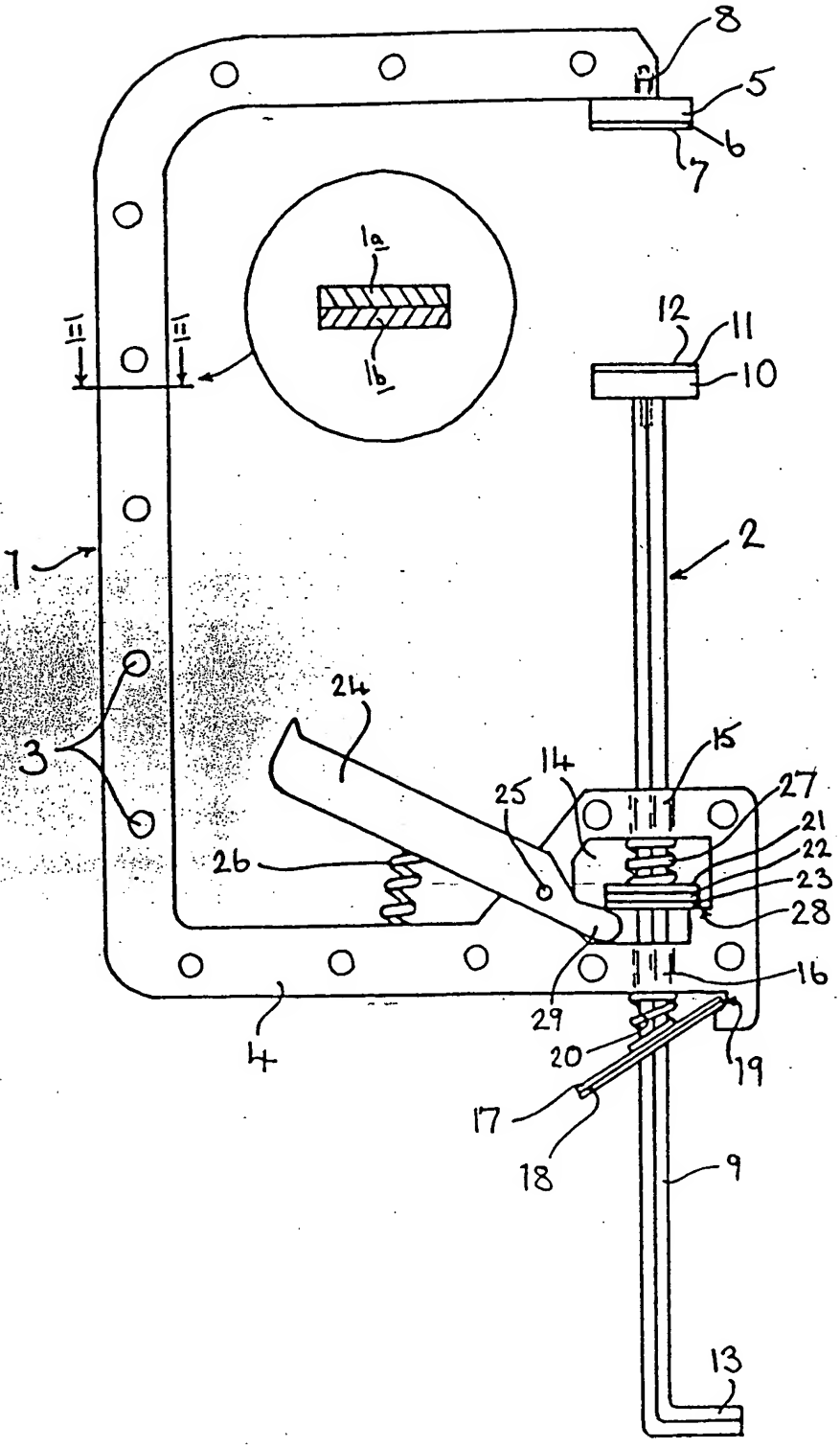
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.



SPECIFICATION

Clamps

This invention relates to hand-operated clamps such as are often used in carpentry or metalwork for temporarily holding one or more components while they are glued or welded. Examples of such clamps include G-clamps and cramps.

A major well-recognised shortcoming of clamps currently on the market is that they all require two hands to operate them—one to hold the clamp in position and one to operate the clamping mechanism.

The aim of the present invention is to provide a form of clamp which can be operated using only one hand.

The broad concept of the present invention lies in the provision of a clamp having a pair of opposed clamp faces at an adjustable distance apart, the clamp comprising a frame carrying a first clamp face, a thrust member carrying a second clamp face and guided for axial movement relative to the frame, one-way means acting on the thrust member to permit undirectional movement thereof towards the first clamp face, and a hand-operated trigger which acts on the thrust member to advance it towards the first clamp face.

Thus the present clamp can be held in one hand and the thrust member advanced simply by operating the trigger.

The present clamp also overcomes a further problem frequently encountered with conventional clamps in which the thrust member is advanced using a screw action. Although in such clamps the respective clamp face may be provided by an element which is rotatable relative to the screw portion of the thrust member it still has a tendency to twist off a workpiece as the screw is tightened. In the present clamp no such screw action is necessary so this problem is avoided.

Although the one-way means may take various forms the preferred arrangement comprises a locking plate system located about the thrust member and tiltable relative to the axis of the thrust member between a locking position and a released position, the locking plate system being biassed into the locking position. The locking plate system preferably comprises at least two co-acting locking plates.

The trigger preferably acts on the thrust member via a drive plate system arranged for reciprocation axially of the thrust member and arranged to tilt relative to the axis of the thrust member between a drive position on the forward stroke to advance the thrust member and a released position on the return stroke. The drive plate system preferably comprises at least two co-acting drive plates.

A further disadvantage with conventional clamps relates to their manufacturing costs. The use of a screw member previously referred to requires a costly machining operation but the present clamp can be manufactured using no machined parts. The frame may comprise a metal stamping, or more preferably, a superimposed pair of metal stampings having conjoined recesses to receive the thrust member.

There now follows, by way of example, a description of a G-clamp constructed in accordance with the broad concept of the invention.

The clamp is described with refrence to the accompanying drawing which is a side view of the clamp with an inset section on line II-II.

The clamp comprises a generally C-shaped frame 1 and a thrust member 2.

The frame 1 is formed by a pair of superimposed portions 1*a*, 1*b*, each stamped from a flat sheet of steel and secured together by spot welds 3. One limb of the C-shaped frame (the lower limb as shown) forms a handle 4. The upper limb has a clamp plate 5 mounted on the inside of its free end. The plate is faced with rubber 6 to provide an inwarly directed first clamp face 7. The plate is mounted on the frame by means of a spigot (not shown) inserted in a pair of conjoined recesses formed by deformations 8 in the stampings 1*a*, 1*b*.

The thrust member 2 is formed of a straight length 9 of hexagonal bar, to one end of which is perpendicularly secured a further clamp plate 10 by means of a further spigot and a socket connection (not shown). The plate 10 is also faced with rubber 11 to provide a second clamp face 12. The opposite end of the bar is bent at right angles to form a hooked end portion 13.

The free end of handle section 4 is enlarged and contains an aperture 14. On each side of the aperture 14 each stamping is deformed out of its plane at 15, 16, to form two pairs of conjoined axially aligned recesses in which the thrust member 2 is non-rotatably guided for axial movement perpendicular to the free end of handle portion 4 with the second clamp face 12 opposed to the first clamp face 7.

In order to permit unidirectional movement of the thrust member 2 towards the first clamp plate 5, a one-way locking arrangement is provided by a pair of superimposed, relative movable locking plates 17, 18, located about the bar 5. Each plate contains a hexagonal hole slightly larger than the bar 9. One edge of each plate 17, 18 is located in a notch 19 in the stampings 1*a*, 1*b*, and a compression spring 20 is located about the bar 9 to bear against the stampings 1*a*, 1*b* and plate 17. The locking plates are thus urged into an angular/tilted position relative to the axis of the bar 9 so that they grip the bar. Any movement of the member 2 away from the first clamp face 7 tends to further tilt the locking

plates increasing their grip on the bar 9. On the other hand, movement in the opposite direction tends to carry the plates towards a perpendicular released position against the action of the spring 20 so that their engagement with the bar is released.

In order to advance the thrust member 2 towards the first clamp face 7 to permit a workpiece to be clamped between the clamp faces 7, 12, a hand-operated drive mechanism is provided. This comprises a set of three identical, superimposed relatively movable drive plates 21, 22, 23, located about the bar 9 within the aperture 14, and each having a hexagonal aperature slightly larger than the bar 9. A trigger 24 is pivoted at 25 to the stampings 1*a*, 1*b* and is urged away from the handle portion 4 by the compression spring 26. A further compression spring 27 is located about the bar 9 to bear against the stampings 1*a*, 1*b* and forward drive plate 21. The plates are thus urged into a position in which one edge of rearward stamping 23 rests against a shoulder 28 on the stampings 1*a*, 1*b*, and the opposite edge rests on a nose 29 carried by the trigger 24 on the opposite side of the pivot 25. Thus, in this position the drive plates 21–23 are substantially perpendicular to the bar 9 and do not restrict its axial movement.

A workpiece can be clamped between the clamp faces 7, 12, using only one hand to operate the claim. The handle 4 is held in the hand and the trigger 24 is squeezed towards the handle 4. This causes the nose 29 to pivot forwardly and tilts the drive plates 21–23 urging them into engagement with the rod 9. Further pivoting of the trigger 24 causes the plates to advance the thrust member towards the clamp face 7. When the trigger is released the plates return to their rest position under the action of spring 27, although return of the thrust member is prevented by the action of locking plates 17, 18. The required degree of travel is produced by repeated squeezing and releasing of the trigger 24. Once both clamp faces 7, 12, come into contact with the workpiece the trigger 24 is squeezed to apply the required clamping force.

To release the clamp the thumb is used to depress the locking plates 17, 18, so that the engagement of plates 17, 18 with the rod 9 is released. Hook portion 13 can be located over a convenient corner to withdraw the thrust member so that again only one hand is required.

Since the thrust member 2 operates with a linear motion rather than a screw action the problem of the clamp plate 10 tending to twist off a workpiece no longer exists.

The clamp plates 5, 10, can be replaced with ones designed to grip round bars or other shaped articles. The plates may have V-shaped grooves in their clamp faces for example.

The use of a number of separate locking plates as opposed to a single one gives a better grip on the bar 9 and permits a high clamping force to be developed. The use of several drive plates 21–23 similarly gives an improved driving grip on the bar.

The clamp is easy to manufacture since no machined parts are required.

CLAIMS

1. A clamp comprising a pair of opposed co-acting clamp faces, a frame carrying a first of the clamp faces, a thrust member guided for axial movement relative to the frame and carrying the second of the clamp faces, one-way means which acts to permit unidirectional movement of the thrust member in a clamping direction so as to carry the second clamp face towards the first, and a hand operated trigger arranged to advance the thrust member in the clamping direction.

2. A clamp according to Claim 1, in which the one-way means comprises a locking plate arrangement located about the thrust member and tiltable relative to the axis of the thrust member between a locking position and a released position, the locking plate arrangement being biassed into the locking position.

3. A clamp according to Claim 2, in which the locking plate arrangement comprises at least two co-acting locking plates.

4. A clamp according to any preceding claim, in which the trigger acts on the thrust member via a drive plate arrangement which is arranged for reciprocation axially of the thrust member and arranged to tilt relative to the axis of the thrust member between a drive position on the forward stroke to advance the thrust member and a released position on the return stroke.

5. A clamp according to Claim 4, in which the drive plate arrangement is located about the thrust member.

6. A clamp according to Claim 4 or 5, in which the drive plate arrangement is biassed into the released position.

7. A clamp according to Claim 4, 5 or 6, in which the trigger is pivoted to the frame and carries an actuating nose which acts on the drive plate arrangement.

8. A clamp according to Claim 7, including further biassing means acting between the trigger and the frame so as to bias the trigger away from a handle portion of the frame, the arrangement being such that when the trigger is pivoted towards the handle portion the actuating nose first tilts the drive plate arrangement into the drive position and thereafter causes the drive plate arrangement to advance the thrust member (2).

9. A clamp according to any of Claims 4 to 8, in which the drive plate arrangement comprises at least two co-acting drive plates.

10. A clamp according to any preceding claim, in which the first and second clamp

faces are provided by respective first and second clamp members which are removably connected to the frame and thrust member respectively.

11. A clamp according to any preceding claim, in which the clamp faces comprise V-shaped grooves.

12. A clamp substantially as described with reference to the drawings.

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